

The Geostationary Coastal and Air Pollution Events (Geo-CAPE) Mission: 2nd Community Workshop



Jay Al-Saadi & Carlos Del Castillo, NASA HQ

Program Scientists

Lawrence Friedl, NASA HQ

Applied Sciences Lead

Nand Topiwala, NASA HQ

Program Executive

Laura Iraci, NASA ARC

Mission Coordinator

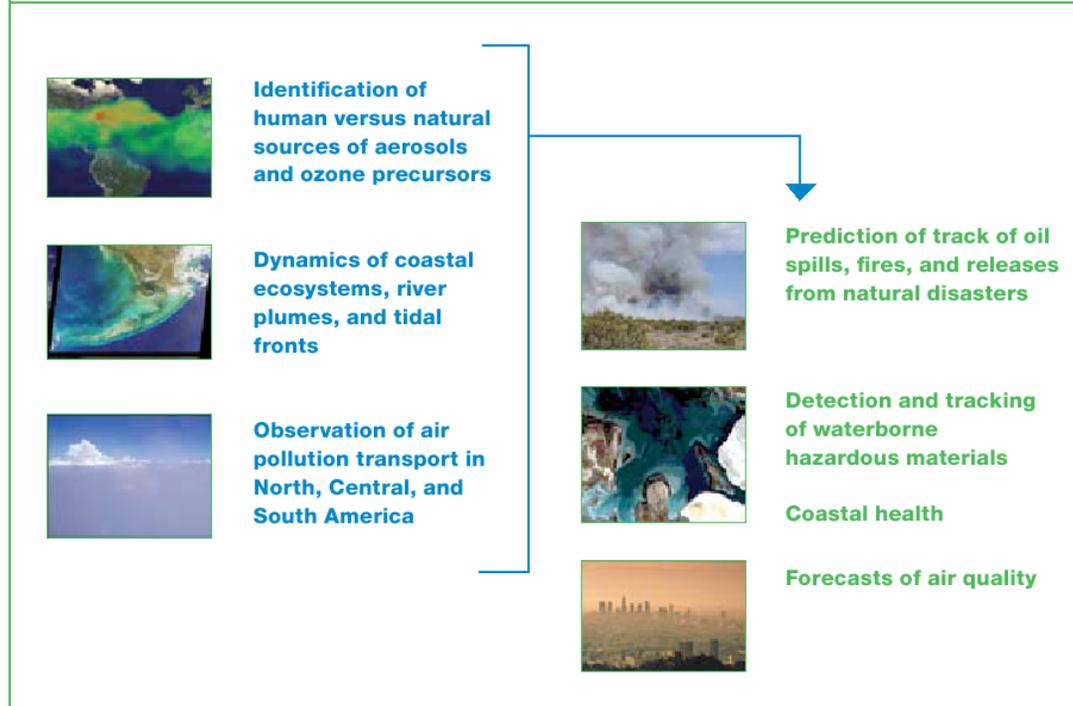
*Boulder, CO
May 11-13, 2011*

2007 NRC Decadal Survey GEO-CAPE mission and payload concept



GEOSTATIONARY COASTAL AND AIR POLLUTION EVENTS (GEO-CAPE)

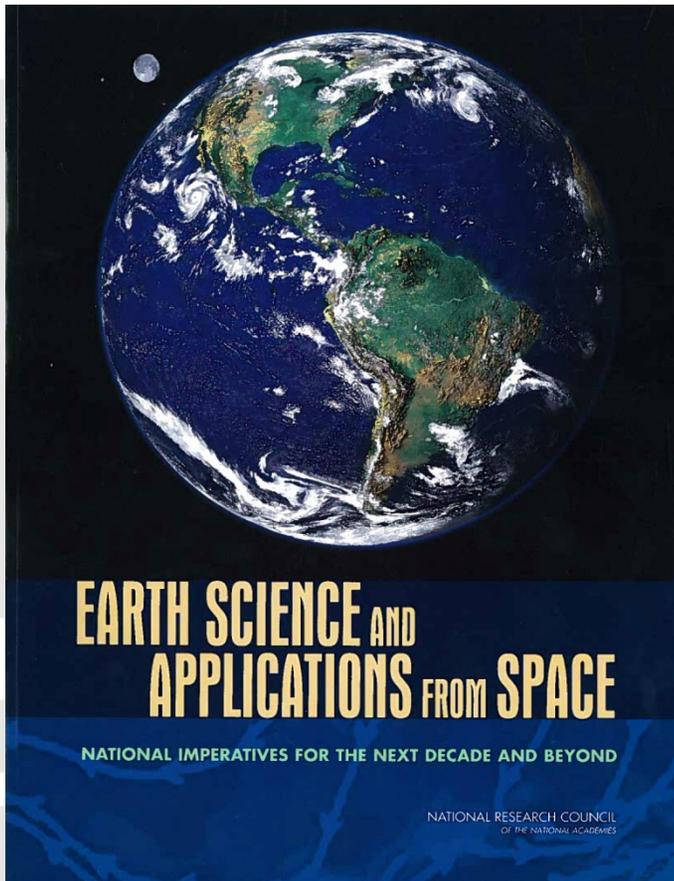
Launch: 2013-2016 Mission Size: Medium



*GEO-CAPE consists of three instruments in geosynchronous Earth orbit near 80°W longitude: a UV-visible-near-IR wide-area imaging spectrometer (7-km nadir pixel) capable of mapping North and South America from 45°S to 50°N **at about hourly intervals**, a steerable high-spatial-resolution (250m) event-imaging spectrometer with a 300-km field of view, and an IR correlation radiometer for CO mapping over a field consistent with the wide-area spectrometer*

The revolutionary advance for both disciplines is observations many times per day

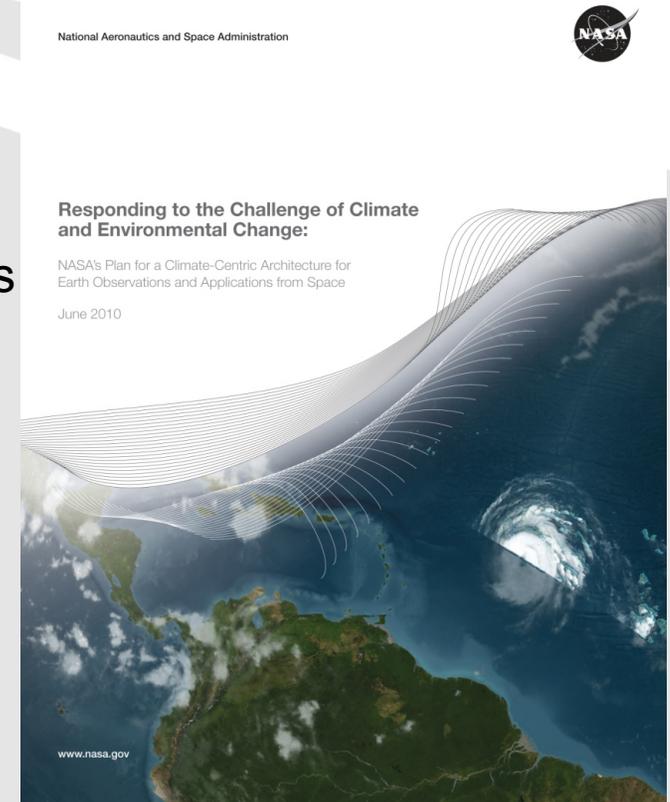
Guiding Recommendation Documents



Administration priorities
and constraints



Decadal survey,
OCO-2,
climate continuity
missions,
balanced program
Integrated Program



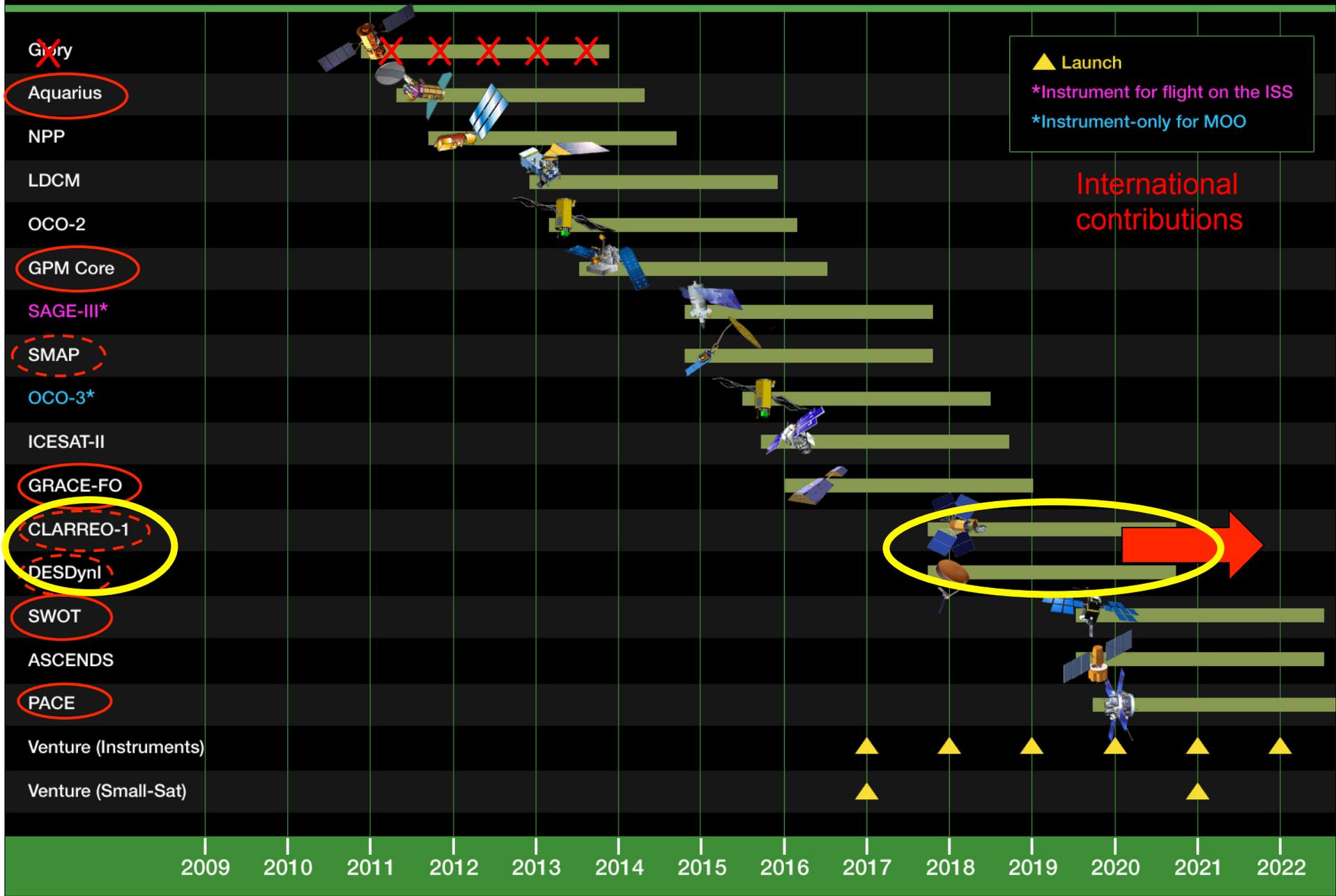
2007 Decadal Survey

- Research and Applications communities priorities
- No realistic budget constraint (calls for \$2B funding [FY06 constant \$\$ beginning in FY10])

http://science.nasa.gov/media/medialibrary/2010/07/01/Climate_Architecture_Final.pdf

- Dec Surv + Administration priorities
- Executable for FY11 Pres. Bud.
- OSTP, USGCRP, OMB approval

Future Orbital Flight Missions – 2010 – 2022



What's been happening with GEO-CAPE since the DS?



- ◆ Increasing urgency for GEO-CAPE observations over the US
 - *US air quality policies growing more rigorous (new rules, revisions of standards) placing more emphasis on expanded monitoring and international conventions*
 - *Increasing emphasis on carbon cycle and water quality (particularly in coastal ecosystems), short lived climate forcers, and air quality/ climate co-benefits*
- ◆ Challenging economic situation and budget environment
 - *GEO-CAPE not presently scheduled for launch before 2021*
 - *Have not been held back – rather, have not been accelerated*
- ◆ Increased US Government emphases on International cooperation and commercial access to space (2010 National Space Policy)
- ◆ Advancement of similar missions in Europe and Asia presents opportunity to achieve GEO-CAPE science globally through partnership
 - *Korea has placed the first geostationary OC mission in orbit, with a planned operational follow-on; Europe proposing geo OC missions*
 - *European and Korean geostationary AQ missions approved for 2018 launches*
- ◆ GEO-CAPE working groups developing science, applications, instrument and alternative mission concepts to adapt to these events and potentially enable compelling science sooner.

Recent Accomplishments and Current Status



- ◆ Peer-reviewed publications and ongoing studies are establishing the science basis and observing requirements for GEO-CAPE
- ◆ NASA ESD approval to assess a mission concept of separate hosted payloads
 - *Compared with a single large observatory, an alternative implementation of distributed payloads is feasible, will enable science/applications sooner due to a more flexible cost profile, would lower mission risk, and **may** reduce overall mission cost*
- ◆ The EV-1 DISCOVER-AQ investigation (2011-2014) will help establish how remote sensing observations many times per day will be combined with ground based measurements in integrated observing systems for Air Quality and Ocean Color.
- ◆ There are no critical **enabling** technology needs. The GEO-CAPE mission as described in the DS can be implemented using instrumentation having LEO space heritage.
 - **Revolution is in temporal resolution** – many times per day
 - *Instruments, algorithms and products continue to evolve from EOS-era missions*
 - *Plan to compete instruments => challenging to specify the right blend of requirements*
- ◆ There are **enhancing** technology needs. Priorities align with NASA ESTO and GEO-CAPE funded activities.
 - **3 new ESTO IIP selections** – excellent!
 - *Reduce payload size*
 - *Instrument capabilities to enhance science return, including retrieval of additional policy-relevant species and optimizing spectral and spatio-temporal coverage*
 - *Pointing solutions – survey study underway*

Next Steps and Issues (1)



- ◆ What ESD would like (no later than end of FY12, but the sooner the better):
 - ◆ **“Define the minimally acceptable scientifically viable mission”**
 - *What is essential in GEO-CAPE to enable next-generation science and applications? What can/should come from somewhere else?*
 - *Update the definition of GEO-CAPE’s cost box. Iterative process with emphasis on cost realism and compelling science.*
 - ◆ To get to this point, we’ll have to evaluate a range of mission concepts, each of which has de-scope options.
 - *SWGs must work out how to interpret this with respect to their threshold and baseline requirements as expressed in current Science Traceability Matrices*
 - ◆ Critical to define the optimum size of the box. In general:
 - *Bigger = Later*
 - *Unrealistically low cost will be met with skepticism*
 - *Do compelling science. Many times per day.*

Next Steps and Issues (2)



- ◆ GEO-CAPE has not been accelerated because of certain **perceptions**, which are **barriers**. Are these perceptions accurate, can we alter them?
 - *It's a monolith. Big and expensive.*
 - *Benefit, or urgency, is not as high as other missions (perhaps because its role in an integrated National plan has not yet been **embraced**?)*
 - How is GEO-CAPE part of a system? What else is impacted if it is delayed?
 - E.g., Climate Initiative expresses how pieces fit together for carbon cycle, water
 - There are drafts; current CEOS ACC and IOCCG white papers latest in a series
- ◆ We are working on the cost/risk aspect (instrument size, hosted payloads)
 - *There are issues to be resolved to allow splitting (and make it make sense)*
- ◆ We have so far been working on the benefit aspect in terms of capability
 - *Assessing value (capability vs. cost) is the next step, e.g. Value Matrix*

Summary and Recommendations



- ◆ GEO-CAPE team is making excellent progress. HQ very supportive of the direction we have been going over the past year.
- ◆ Continue to work with user communities to **assess value** of candidate observations, express user requirements, and foster national advocacy as appropriate.
- ◆ Identify whether there are **required** co-dependencies of the atmosphere and ocean missions or whether there is potential added value when they are viewing at the same time and location.
- ◆ Prepare for uncertain budgets – either cuts or opportunities. Be ready with solutions for different levels of resources and time horizons that are each perceived as meeting high priority needs with excellent value.
- ◆ Think small and dream large? We can change the paradigm that geostationary observations are too expensive, pioneering a new era of continuous Earth observations. Challenge ourselves!
- ◆ Keep focus. GEO-CAPE's revolution is observing at high temporal frequency. Other aspects of capability are negotiable (resolution, data products, ...).